

THE GENERA OF ANACARDIACEAE IN THE
SOUTHEASTERN UNITED STATES¹

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ANACARDIACEAE Lindley, Intr. Nat. Syst. 127. 1830. nom. cons.

(CASHEW FAMILY)

Trees or shrubs, rarely subshrubs or vines, with resin ducts in bark and often in leaves, flowers, and fruits. Leaves alternate [very rarely opposite or verticillate], simple, 3-foliolate, or pinnate, deciduous or persistent, exstipulate. Flowers small, usually regular, hypogynous [rarely perigynous or epigynous], usually unisexual by abortion or both uni- and bisexual [rarely bisexual throughout], in axillary and/or terminal thyrses or panicles, more rarely in solitary or paniced spikelike racemes; bracts deciduous or persistent, bractlets 2, deciduous or persistent, or wanting. Perianth double [rarely simple or absent], usually 5-merous. Sepals usually connate at least at base, imbricate [or valvate]. Petals usually distinct, imbricate [or valvate]. Stamens 5–10 [or very rarely more], sometimes only 1 or 2 fertile in ♂ flowers, distinct [or basally connate], reduced and sterile [or wanting] in ♀ flowers; anthers versatile, 2-locular at anthesis, introrse, longitudinally dehiscent. Intrastaminal (or rarely extrastaminal) nectariferous disc usually 5- or 10-lobed [sometimes produced into a gynophore, rarely absent]. Gynoecium syncarpous [or apocarpous], 3[–5]-carpellate or 1-carpellate by reduction, rudimentary [or absent] in ♂ flowers; stigmas 1–3[–5]; styles 1–3[–5]; ovary 1[3–5]-locular; ovules anatropous, apotropous, solitary in a locule, the funicle usually elongate with a basal, parietal, or apical insertion. Fruit usually drupaceous, with ± resinous and sometimes waxy or oily mesocarp and crustaceous or bony endocarp (stone). Seeds with scanty endosperm or endospermless; embryo ± curved [or straight]. (Terebinthaceae Juss., 1789; Spondiaceae Kunth, 1824.) TYPE GENUS: *Anacardium* L.

¹Prepared for a generic flora of the southeastern United States, a joint project of the Arnold Arboretum and the Gray Herbarium of Harvard University, made possible through the support of George R. Cooley and the National Science Foundation and under the direction of Reed C. Rollins and Carroll E. Wood, Jr. This treatment follows the pattern established in the first paper in the series (Jour. Arnold Arb. 39: 296–346. 1958) and continued through those in volumes 40–43 (1959–1962). It should be repeated that the area covered by this work is bounded by and includes North Carolina, Tennessee, Arkansas, and Louisiana. The descriptions are based primarily on the plants of this area, with any supplementary material in brackets. References which the author has not seen are marked by an asterisk.

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A family of about 70 genera with nearly 600 species, primarily pantropical, extending with several genera into the temperate zones of both hemispheres. Of the five tribes, only Rhoëae (Rhoideae) and Anacardiaceae (Mangifereae Marchand emend. Engler) are represented in our area, the former by three indigenous genera and a naturalized species of *Schinus*, the latter by a species of *Mangifera* naturalized in southernmost Florida. Since generic lines in the Rhoëae are often weak and differently interpreted, various authors have recognized one to five indigenous genera in our area.

The family, with a few exceptions (e.g., *Pistacia* L.), is considered to be entomophilous. Since the species are mostly dioecious or polygamo-dioecious, cross-pollination should be the rule. Apomixis (adventitious polyembryony) has been found in some species of *Mangifera*, parthenocarpy in several genera. Cytological data presently known for about 25 species in ten genera ($2n = 24, 28, 30, 32, 40, 42, 48, 60$) suggest polyploidy. Resin of many species is poisonous on contact.

The family is believed to be closely allied with Sapindaceae and Julianaceae. Wood-anatomical and palynological evidence seems to support the assumption of a close relationship with Burseraceae, from which Anacardiaceae differ essentially in the uniovulate ovary locules and in apotropy of the ovules.

Anacardiaceae are economically important for edible fruits (e.g., *Mangifera indica*, mango; *Spondias* spp., mombin) or nuts (*Anacardium occidentale* L., cashew; *Pistacia vera* L., pistachio), for resins (e.g., *Pistacia Lentiscus* L., mastic) and lacquers (*Rhus verniciflua*), for tannins (*Cotinus Coggygria*, *Rhus* spp., *Schinopsis* spp.), and for timbers (*Schinopsis* spp., red quebracho; *Astronium* spp., zebrawood or kingwood). Some species are ornamentals.

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KEY TO THE GENERA OF ANACARDIACEAE

General characters: *woody plants with resin ducts in bark, leaves, flowers, and fruit; flowers small, usually hypogynous, unisexual or uni- and bisexual, in axillary and/or terminal thyrses or panicles; perianth double, usually 5-merous; stamens 5-10; nectariferous disc intra- or rarely extrastaminal; gynoecium 1-3 [-5]-carpellate, ovary usually 1-locular by abortion; fruit drupaceous.*

- A. Flowers ♂ and bisexual; petals with longitudinal ridges; disc extrastaminal; stamens 5, only 1 or 2 fertile; gynoecium 1-carpellate; drupes large to very large, with copious juicy flesh; leaves simple; naturalized tree of subtropical Florida. 1. *Mangifera*.
- A. Flowers usually unisexual; petals not ridged; disc intrastaminal; stamens 5 or 10, all fertile in ♂, all reduced and sterile in ♀ flowers; gynoecium 3-carpellate; drupes small, not exceeding 15 mm. in length, with meager drying flesh; leaves various.
- B. Stamens 10; drupes spicy-aromatic, containing oil cavities adherent to stone; leaves pinnate, with winged rachises; naturalized shrubs or small trees of southern Florida. 2. *Schinus*.
- B. Stamens 5; drupes not aromatic, without oil cavities; leaves various, if pinnate, rachises not winged, except in *Rhus copallina*.
- C. Stigma 1, 3-lobed; style 1, very short, stout; drupes 10-15 mm. long, ellipsoid to obovoid, scarlet to orange, glabrous; endocarp thin, crustaceous; leaves odd-pinnate, leaflets long petioluled; poisonous trees or shrubs of subtropical Florida. 3. *Metopium*.
- C. Stigmas and styles 3; drupes 3-8 mm. long, subglobular or subreniform (covered with glandular club-shaped hairs if red or orange); endocarp thick, bony; leaves various (if pinnate, leaflets sessile or short petioluled).
- D. Styles appearing sublateral in flowers; drupes obliquely subreni-

- form, usually much compressed laterally, prominently reticulate, glabrous, the remnants of styles lateral; mesocarp very scanty; pedicels of aborted flowers becoming plumose-villous; leaves simple; innocuous trees or shrubs. 4. *Cotinus*.
- D. Styles terminal; drupes subglobular, usually slightly compressed laterally, not reticulate, sometimes with simple and/or glandular hairs; mesocarp thickish, resinous and sometimes also waxy; pedicels never plumose; leaves 3-foliolate or odd-pinnate; trees, shrubs, or vines, some poisonous. 5. *Rhus*.

Tribe ANACARDIEAE

1. *Mangifera* Linnaeus, Sp. Pl. 1: 200. 1753; Gen. Pl. ed. 5. 93. 1754.

Mostly large evergreen trees, the leaves alternate [rarely verticillate], simple, entire, membranaceous to coriaceous, petiolate, persistent. Plants polygamous, usually andromonoecious. Flowers small, ♂ and bisexual, in terminal [and/or axillary] thyrses; pedicels articulated; bracts and bractlets deciduous. Sepals 5 (4 or 6), deciduous. Petals 5 (4 or 6), distinct [or adnate to the disc at base], the veins thickened into [1-]3-5 prominent ridges, deciduous. Disc extrastaminal, tumid [or minute, sometimes stipe-like, or wanting], 5-lobed. Stamens usually 5 [rarely 10-12], inserted just within [or on] the disc, distinct [or connate at base], usually 1 or 2 [rarely 5 or 6] fertile, the rest remaining sterile with imperfect small anthers [or reduced to toothlike projections]; pollen 3-colpate, small to medium sized, ellipsoidal, finely reticulate. Gynoecium 1-carpellate (exceptionally 2-carpellate, apo- or syncarpous), rudimentary or wanting in ♂ flowers; stigma simple; style sublateral; ovary obliquely subglobular, 1-locular, sessile; ovule solitary, funicle subbasal. Fruit a large [or relatively small] drupe of various shapes and colors; exocarp ± leathery; mesocarp thick, fleshy, sweet [to acid], sometimes resinous; stone compressed, usually hard, woody, coated with fibers. Seed large, compressed; testa papery; endosperm lacking (or scanty?); embryo subreniform with plano-convex, often unequal and lobed cotyledons and small ascendent radicle; germination hypogeous. TYPE SPECIES: *M. indica* L. (From Portuguese, *mango*, the common name for this fruit, and Latin *-fera*, bearing, i.e., "bearing mangoes.")

An Indo-Malayan genus of about 40 species. *Mangifera indica* (including *M. laurina* Bl.), common mango, $2n = 40$, presumably native to India (and perhaps to Indochina and the Sunda Islands), widely cultivated throughout the tropics for its edible fruits, has become naturalized in hammocks of southern Florida and the Florida Keys. A tree with relatively large, narrow leaves and large to very large, ovate to subreniform or subcylindrical, yellowish or greenish fruits sometimes flushed with scarlet or crimson, the species has been in cultivation in the tropics of the Old World for over four thousand years and shows a wide range of variation, about a thousand wild forms and cultivars occurring in India.

Mangifera indica is the only economically important species. Its fruits, mangoes, are said to be eaten by at least one-fifth of the world's population. In India the astringent flowers, seeds, and bark find medicinal application, especially in diarrhoea. Bark and leaves yield a yellow dye used locally in southern Asia. The wood, said to be of excellent quality, is used extensively in India for carpentry, cabinet-work, boat-building, etc.

Short-tongued insects, especially Diptera, Hymenoptera, and Coleoptera, seem to be the principal pollinators of *Mangifera indica*. Cross-pollination seems to be the rule. Since self-pollination has not been recorded, one may assume that the morphologically bisexual flowers are (at least in most cases) functionally (physiologically) carpellate. The somatic chromosome number $2n = 40$ has been recorded for 23 grafted varieties and one wild race of *Mangifera indica*, as well as for *M. sylvatica* Roxb., *M. caloneura* Kurz, *M. caesia* Jack, and *M. foetida* Lour. Although no polyploid series has been found in the genus, Mukherjee (1950) suggested on the basis of his cytological analysis that *M. indica* and its allies are allopolyploids. No records of natural or artificial interspecific hybrids have been available, but Mukherjee (1957) remarked that "similarity in the chromosome number and morphology and in the pollen size and morphology . . . indicates that there may be close compatibility among the species during hybridization and in stock-scion relationship in grafting . . ."

Apomixis (adventitious polyembryony) has been recorded in *Mangifera indica* and in *M. odorata* Griff., the embryos originating either from the nucellus or by budding from the cotyledons and hypocotyl. While Indian "seedling races" and "horticultural [grafted] varieties" are almost exclusively monoembryonic, the "seedling races" common in culture in some other countries ("Philippine" or "Manila" races) mostly are polyembryonic. There are, however, records indicating that some "Indian races" considered monoembryonic in India yielded a considerable percentage of polyembryonic seeds when grown in the Philippines.

Although *Mangifera indica* is usually innocuous and dermatitis caused by its resin is infrequent, several wild species (e.g., *M. caesia*, *M. foetida*, *M. odorata*, and *M. lagenifera* Griff.) sometimes cultivated in the Malaysian region for their edible fruits are regarded as positively poisonous.

The genus seems to be related to the Malayan *Bouea* Meisn. and to the tropical American *Anacardium* L.

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Tribe RHOËAE Marchand, "Rhoideae"

2. *Schinus* Linnaeus, *Sp. Pl.* 1: 388. 1753; *Gen. Pl.* ed. 5. 184. 1754.

Trees or shrubs [rarely subshrubs, sometimes thorny]. Leaves odd-pinnate or rarely even-pinnate [or simple]; the leaflets membranaceous to subcoriaceous [or coriaceous], (3)5-13[-41], usually opposite [or alternate], relatively small to medium sized, entire or toothed, sessile or subsessile, the rachis often winged. Plants usually dioecious. Flowers usually unisexual, small, pediceled, in axillary [and terminal] thyrses [or in contracted raceme-like inflorescences]; bracts small, bractlets 2, minute, deciduous. Sepals 5 [4], persistent. Petals 5 [4], white [or yellow], considerably longer than the sepals. Stamens 10 [8], in 2 series, the antipetalous shorter than the antisepalous, inserted below and between the lobes of a saucer-shaped 10[8]-lobed intrastaminal nectariferous disc, reduced and sterile in ♀ flowers; pollen 3-colpate, medium sized, ellipsoidal, finely reticulate. Gynoecium 3-carpellate, rudimentary in ♂ flowers; stigmas 3 [1], capitellate; styles 3 [1], connate at least at base; ovary sessile, 1-locular by abortion; ovule solitary, 2-integumented, with a thick nucellus, suspended from near the top of the locule. Drupe small, pea-like, bright red [pink or lavender]; exocarp thin, chartaceous, shining; mesocarp resinous, the innermost layers (adherent to endocarp) with large cavities containing an aromatic oil; stone laterally compressed, cartilaginous to bony. Seed sublenticular; testa thin, membranaceous; endosperm fleshy, scanty; cotyledons flat; radicle elongated, incurved upwards. (Including *Duvaua* Kunth). LECTOTYPE SPECIES: *S. Molle* L., $2n = 28, 30$; see A. S. Hitchcock, *in* *Int. Bot. Congr.* 1930. *Nomencl. Propos. Brit. Bot.* 153. 1929. (An ancient Greek name for the mastic tree, *Pistacia Lentiscus* L., applied by Linnaeus to this genus.) — PEPPER-TREE.

A genus of about 28 species of warm-temperate and tropical South

America, from Chile, Argentina, and Uruguay, north to Venezuela and Colombia. *Schinus terebinthifolius* Raddi, Brazilian pepper-tree or Christmas-berry, with 5–13 oblong-ovate leaflets, and *S. Molle*, Peruvian pepper-tree, with 15–41 very narrow leaflets, are frequently cultivated in the warmer parts of the Eastern and Western hemispheres as ornamentals. Both are grown in Florida, and the former, a shrub, has become naturalized in southern Florida and the Keys where it seems to be spreading rapidly; the exact extent of naturalization needs to be determined. *Schinus Molle* has become naturalized in California and Mexico. The infructescences are often used as Christmas decorations. In Mexico and South America the fruits are used in various beverages, the seeds are sometimes used to adulterate pepper, and the resin, bark, and fruits are used locally in medicine.

The genus seems to be most closely related to the South American *Lithraea* Miers and the East Australian *Rhodospaera* Engl. The group is entomophilous, and honeybees have been reported as frequent visitors of flowers of *Schinus Molle*. No hybrids have been recorded.

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3. *Cotinus* Miller, *Gard. Dict. Abr. ed.* 4. 1754.

Small trees or shrubs with orange-yellow wood and strong-smelling, resinous sap. Leaves simple, entire, medium sized [or small], membranaceous, deciduous, the petioles short to long. Plants usually dioecious [occasionally polygamo-dioecious or -monoecious]. Flowers small, usually unisexual [rarely also bisexual], many abortive, in loose terminal thyrses, the slender pedicels much elongated after flowering, those of abortive flowers becoming plumose-villous; bracts narrow, \pm scarious, in part persistent. Sepals 5, persistent. Petals 5, yellowish- or greenish-white [rarely crimson], twice as long as the sepals. Stamens 5, distinct, inserted below an annular, shallowly 5-lobed intrastaminal disc, alternate with and shorter than the petals, reduced and sterile in ♀ flowers; filaments

subulate; anthers broadly ovate in outline, somewhat shorter than the filaments, 2-locular at anthesis; pollen 3-colpate, medium sized, sub-spherical, striate-reticulate, with round to slightly oblong, smooth germ pores. Gynoecium 3-carpellate, rudimentary in ♂ flowers; stigmas 3, small, subcapitate; styles 3, appearing sublateral, unequal, that of the fertile carpel conspicuously longer than the 2 sterile ones; ovary 1-locular by abortion, obliquely obovoid, sessile; ovule raised on a basal funicle. Drupes small (4–5 mm. long), obliquely obovate to subreniform, usually much compressed, conspicuously reticulate veined, the style-remnants lateral; exocarp membranaceous; mesocarp very scanty; stone (endocarp) bony, subreniform, 1-seeded. Seed reniform; testa thin, membranaceous; endosperm wanting (?); embryo with flat, elliptic cotyledons and an elongate radicle incurved upwards (toward the hilum). TYPE SPECIES: *Rhus Cotinus* L. = *Cotinus Coggygia* Scop. (Derived from Greek, *kotinos*, an ancient name for wild olive, used by Pliny for an unidentified shrub of the Apennines, but applied by some pre-Linnaean botanists, e.g., Tournefort, to *C. Coggygia*.) — SMOKE-TREE.

A genus of three or more species, primarily of warm-temperate Eurasia (southern France to the eastern subtropical Himalaya and central China) and eastern North America. *Cotinus obovatus* Raf. (*C. americanus* Nutt., *Rhus americanus* (Nutt.) Sudworth), American smoke-tree,² a tree, sometimes a low shrub, with obovate-cuneate leaves turning orange to crimson in autumn, occurs sparingly on wooded, rocky cliffs and river bluffs, usually on limestone, in disjunct populations in the mountains of northern Alabama and adjacent Tennessee (Franklin County); in Daviess County, Kentucky (introduced?); in southwestern Missouri, northwestern Arkansas, and eastern Oklahoma; and on the Edwards Plateau, Texas. "Its rarity, discontinuous distribution, lack of related species in the New World, and occurrence as a pioneer on rocky cliffs all suggest that [it] is an old species formerly of general distribution but now approaching extinction" (Little, p. 23). Trees to about 10 m. tall have been recorded, but Sargent (1892) wrote that "during the War of Secession nearly all the large specimens were cut down for the dye which the wood yields . . ."

Most observations on the genus have been made on the Eurasian *Cotinus Coggygia*, Venetian sumac or smoke-tree,² in which polygamo-dioecism and monoecism, as well as flowers with 3-locular ovaries, have been observed occasionally. Short-tongued Hymenoptera and Diptera apparently are the principal pollinators. Parthenocarpy seems to be of common occurrence, since many fruits fail to develop seeds. Although birds have

² Since the above was written, chromosome numbers of three taxa of *Cotinus* have been determined by Dr. Otto T. Solbrig, of the Gray Herbarium, from staminate material collected by Dr. C. E. Wood from the living collections of the Arnold Arboretum: *C. obovatus* (Arnold Arb. No. 1814-B, from seed, Charles Mohr, Mobile, Alabama, July 5, 1882; *Wood* 9427 [AAH]), $2n = 15^{11}$; *C. Coggygia* (Arnold Arb. No. 276, from Harvard Bot. Gard., 1876; *Wood* 9428 [AAH]), $2n = 15^{11}$; and *C. Coggygia* 'Atropurpureus' (Arnold Arb. No. 708-49-A, from seed, New York Bot. Gard., 1948; *Wood* 9429 [AAH]), $2n = 15^{11}$.

been mentioned, wind is assumed to be the principal means of seed dispersal by transport of the whole infructescence. Asexual reproduction takes place by root- and stump-sprouts.

In spite of many similarities with *Rhus*, from which *Cotinus* differs mainly in the asymmetrical ovaries and fruits, unequal styles appearing sublateral in flower and lateral in fruit, very scanty mesocarp, and peculiar infructescences, the two genera do not seem to be very closely related. According to Engler, *Cotinus* represents a branch of a line of evolution different from but with a common origin with that of *Rhus*. Some relationship to the South African genera *Laurophyllus* Thunb., *Smodingium* E. Mey., and *Loxostylis* Spreng. f. ex Reichenb. (*Botryceras* Willd.) seems possible.

The leaves and bark of *Cotinus Coggygia* are important sources of tannin and have been employed extensively in the tanning industry in southern Europe. Leaves and flowers yield an aromatic oil. The orange-yellow dye (fustic, "young fustic") extracted from the heartwood of *C. Coggygia* and *C. obovatus* was formerly used extensively for dyeing silk, wool, etc. Both species are ornamental.

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4. *Metopium* P. Browne, Civ. Nat. Hist. Jamaica 177. 1756.

Trees or shrubs with resin ducts in bark and wood. Leaves odd-pinnate, (1)3–7-foliolate, stoutly petioled, usually clustered near the tips

of branches, persistent; leaflets long-petioluled, \pm leathery, entire, lustrous, veins and veinlets prominent. Plants usually dioecious. Flowers small, usually unisexual; pedicels short, stout, and articulate near base, in loose, ascending, determinate axillary panicles; bracts and bractlets minute, in part persistent. Sepals 5, connate into a \pm cupuliform 5-lobed calyx; lobes broadly ovate to almost semicircular [or truncate], \pm unequal, thin-leathery with scarious margins, persistent. Petals 5, twice as long as sepals, yellow-green, with brownish to blackish veins. Stamens 5, distinct, alternate with and shorter than the petals, inserted at base and between the glandlike lobes of an intrastaminal nectariferous disc, reduced and sterile in $\text{\textit{f}}$ flowers; anthers oblong in outline, nearly as long as [or longer than] the subulate filaments, 2-locular at anthesis; pollen 3-colpate, medium sized, ellipsoidal, reticulate-striate, with round, smooth germ pores. Gynoecium 3-carpellate, rudimentary in $\text{\textit{m}}$ flowers. Stigma 3-lobed; style very short, stout; ovary 1-locular by abortion, obovate to subglobular; ovule raised on a basal funicle. Drupe ellipsoidal to somewhat obovoid, about 1–1.5 cm. long, glabrous, shining, orange to scarlet when ripe, tipped with the remnant of the style; exocarp membranaceous, mesocarp resinous, endocarp thin, crustaceous, all permanently united (coherent). Seed compressed, almost quadrangular in outline, the broad funicle covering one of its margins; testa thin, smooth, dark brown; endosperm scanty or wanting; embryo oriented vertically, the cotyledons accumbent, flat, the radicle long, incurved upwards toward the hilum. TYPE SPECIES: *Terebinthus Brownei* Jacq. = *M. Brownei* (Jacq.) Urban. (An ancient name for some oriental plant [perhaps some species of *Ferula*], yielding the gum resin galbanum, applied by Browne to his genus; etymology obscure.)

A genus of three species, of the West Indies, southern Florida, British Honduras, Guatemala, and southern Mexico. The West Indian *Metopium toxiferum* (L.) Krug & Urban, poisonwood or coral sumac (also hog gum, doctor gum), occurs in hammocks, pinelands, and coastal sand dunes in southern Florida (about as far north as Martin County) and on the Florida Keys. A large tree in hammocks, a shrub in pinelands, in its appearance the species resembles *Bursera Simaruba*, with which it is often confused.

The genus is very closely related to *Rhus*, but the combination of the single style and stigma, the thin, crustaceous endocarp, the vertical embryo, and anatomical characters (diffuse-porous wood; abundant, often banded, vasicentric parenchyma; septate wood fibers) seems to support the maintenance of *Metopium* as distinct.

All species are poisonous, and all parts of the plants act as a contact skin-poison. Leaves and resin were formerly used in local medicine in the West Indies. The floral biology probably does not differ much from that of *Rhus*. Birds apparently are responsible for seed dispersal.

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5. *Rhus* Linnaeus, Sp. Pl. 1: 265. 1753; Gen. Pl. ed. 5. 129. 1754.

Trees, shrubs [sometimes thorny], subshrubs, or vines climbing by aërial, clinging, adventitious roots, often pubescent with glandular and/or nonglandular hairs, some poisonous by contact. Leaves 3-foliolate [rarely palmately 5-foliolate] or odd-pinnate (occasionally even-pinnate) [or simple], petioled, deciduous [or persistent]; leaflets usually opposite, entire or toothed, sometimes lobed, sessile or \pm distinctly petioluled, rachis sometimes winged. Plants usually dioecious. Flowers small [to minute], usually unisexual by abortion, pediceled [or sessile], in terminal [and]/or axillary thyrses [or panicles], or in solitary or paniced racemes [or spikes]; bracts deciduous or persistent, bractlets 2, at base of pedicel, deciduous or persistent, or wanting. Sepals 5, connate at base [or higher], usually persistent. Petals 5, longer than the sepals, greenish-white to yellow [or rarely pink], inserted at base of disc, imbricate. Stamens 5, alternipetalous, inserted below a 5–10-lobed, annular, patelli- or cupuliform intrastaminal nectariferous disc, reduced and sterile in $\text{\textcircled{f}}$ flowers; anthers ovate to oblong in outline, usually shorter than the \pm subulate filaments; pollen 3-colpate, medium sized [or small], ellipsoidal to spherical, reticulate, reticulate-striate or striate, more rarely smooth, with oblong, mostly irregular to ragged, germ pores. Gynoecium 3-carpellate, rudimentary in $\text{\textcircled{m}}$ flowers; stigmas 3, capitellate, sometimes slightly depressed; styles 3, terminal, distinct or partly [rarely \pm completely] connate; ovary 1-locular; ovule raised on an elongate ascendent basal funicle. Drupe subglobular to globular, 3–8 mm. [rarely over 1 cm.] in diameter, often somewhat laterally compressed, white, tan to brown, or red [or black], smooth or sometimes striate [rarely verruculose], glabrous or pubescent with glandular and/or nonglandular hairs; exocarp membranaceous, sometimes fragile and bursting irregularly; mesocarp thin or thick, \pm resinous, sometimes also waxy; stone \pm laterally compressed, smooth or ridged, sometimes bumpy, with thick, bony endocarp. Seed \pm laterally compressed, ovate to subreniform in outline; testa membranaceous; endosperm scanty or wanting; embryo large, generally transverse, with flat transverse cotyledons and a \pm elongate radicle incurved upwards toward the hilum. (Including *Lobadium* Raf. [*Schmaltzia* Desv. ex Small emend. Greene], *Toxicodendron* Mill.). LECTOTYPE SPECIES: *R. Coriaria* L.; see E. L. Greene, Leafl. Bot. Obs. Crit. 1: 114.

1905. (Name Latin, from Greek, *rhous* or *rhoys*, an ancient name for the Sicilian sumac, *R. Coriaria*; etymology obscure.)

A genus of over 150 species, primarily of the warm-temperate areas of both hemispheres, but extending into tropical and cold-temperate regions. The genus seems to be somewhat heterogeneous, and its taxonomy is difficult and confused. Both the four sections of Engler, based mainly on fruit morphology, and some fractions of the sections have been treated by Barkley as distinct genera. Although thorough investigations may perhaps justify at least some of these segregations, a complete study of the entire complex is necessary. The relationships appear to be reticulate, with species showing transitions in respect to most characteristics used for delimiting genera, and many supposed differences are based on incomplete observations or on insufficient material. At present it appears preferable to regard *Lobadium* Raf. and *Toxicodendron* Mill. as subgenera of *Rhus*.

Subgenus RHUS (subg. *Sumac* Torr. & Gray, 1838; § *Trichocarpae* Engler, 1881, in part), includes about ten species (primarily of warm-temperate North America and Eurasia) with flowers in terminal thyrses expanding after the leaves; thin, narrow, caducous bracts and bractlets; reddish drupes covered with \pm club-shaped hairs and sometimes also with slender red to colorless nonglandular hairs; exocarp adherent to the resinous mesocarp and both easily detachable from the smooth, bony stone; and odd-pinnate leaves. All (at least in our area) are innocuous trees or shrubs. The northeastern American *Rhus typhina* L. (*R. hirta* (L.) Sudw.); the wide-ranging *R. glabra* L.; the very local *R. Michauxii* Sarg., of the Piedmont of North Carolina and Georgia; and the widely distributed *R. copallina* L. (including *R. leucantha* Jacq. and *R. obtusifolia* Small) represent the subgenus with us. Presumed natural hybrids of *R. glabra* \times *typhina* have been known as *R. glabra* var. *borealis* Britt. (*R. borealis* (Britt.) Greene, *R. pulvinata* Greene), while *R. Ashei* (Small) Greene, recorded from the Piedmont of North Carolina, appears to be *R. glabra* \times *Michauxii*. A careful study of variation in *Rhus copallina* (including vars. *copallina*, *latifolia* Engler, *leucantha* (Jacq.) DC., *obtusifolia* (Small) Fern. & Grisc., and *lanceolata* Gray [the last supposedly beyond our range]) is much needed.

Subgenus LOBADIUM (Raf.) Torr. & Gray, 1838 (*Lobadium* Raf., 1819; *Schmaltzia* Desv. ex Small emend. Greene, 1905; *Rhus* § *Trichocarpae* Engler, 1881, in part; including *Styphonia* Nutt. and *Rhoeidium* Greene) includes species with flowers in short, dense, spikelike racemes usually forming terminal panicles expanding before the leaves (more rarely in axillary and/or terminal panicles expanding after the leaves); leathery, broad, persistent (rarely caducous) bracts and bractlets; drupes essentially as in subg. RHUS (but in some with the inner layers of mesocarp, striate by numerous resin ducts, remaining attached to the stone); and leaves 3-foliolate (in ours). The nearly 35 species, all innocuous shrubs [or trees], are centered in Mexico, extending north to Alberta and Quebec

and south to Costa Rica. The northeastern *Rhus aromatica* Ait. var. *aromatica* (*Schmaltzia crenata* (Mill.) Greene), fragrant sumac, with precocious flowers, is of frequent occurrence on calcareous soils through our area southward to northwestern Florida and westward and northward beyond our limits. The var. *serotina* (Greene) Rehd. (*R. trilobata* Nutt. var. *serotina* (Greene) Barkley), with coetaneous flowers, occurring north and west of our region has been recorded from Arkansas. Hybridization between *R. aromatica* and the largely western American *R. trilobata*, as well as between some other species of the subgenus in areas of overlap, is believed possible (Barkley, 1937).

Subgenus TOXICODENDRON (Mill.) K. Koch, 1853, emend. Gray, 1856 (§ *Venenatae* Engler; § *Trichocarpae* Engler, as to *R. trichocarpa* Miq.; *Toxicodendron* Mill., 1754), comprises species with flowers in axillary thyrses expanding after the leaves; caducous bracts; no bractlets; yellow-white to -brown, usually smooth drupes, glabrous or pubescent with nonglandular hairs; usually thin, fragile exocarp which finally breaks, exposing the whitish, waxy mesocarp striate with black resin ducts; stones bony with a few riblike longitudinal ridges (or more rarely smooth); and leaves 3-foliolate or odd-pinnate [rarely simple]. The nearly 15 species, including trees, shrubs, or woody vines climbing by aërial roots and all producing a contact dermatitis, are largely of temperate North American-eastern Asiatic distribution, but with at least *R. striata* Ruiz & Pavon in tropical South America (Colombia, Venezuela, Peru). Our representatives are *R. Vernix* L. (*Toxicodendron Vernix* (L.) Kuntze), poison sumac, a shrub or small tree with odd-pinnate leaves, chiefly of the Coastal Plain; *R. radicans* L. (*T. radicans* (L.) Kuntze), poison ivy, $2n = 30$; and *R. Toxicodendron* L. (*T. Toxicodendron* (L.) Britt., *T. quercifolium* (Michx.) Greene), poison oak. *Rhus radicans* is both widely distributed and variable, and a number of varieties and forms have been recognized. According to Gillis (1962, p. 21), the eastern Asiatic *R. orientalis* (Greene) Schneider is conspecific with *R. radicans*. The external and internal morphology of *R. diversiloba* Torr. & Gray, western poison oak, $2n = 30$, is better known than that of other species.

The genus seems to be rather uniform in regard to floral morphology and biology. Flowers are usually unisexual and the species dioecious, but the occasional occurrence of bisexual flowers, and consequent polygamy, is probable. Various Hymenoptera (especially short-tongued bees) and Diptera have been recorded as the most frequent visitors. Chalazogamy has been found in all the species thus far investigated. The chromosome number $2n = 30$ has been recorded for three or four species of subg. TOXICODENDRON, $2n = 32$ for the North African *Rhus oxyacantha* Schousb. ex Cav. (*Searsia* Barkley; § *Gerontogaeae* Engler). Seed dispersal by animals, especially by birds, apparently may be assumed for the genus as a whole.

Dried leaves of *Rhus glabra*, *R. typhina*, and *R. copallina*, and especially of *R. Coriaria*, are important sources of tannin. Leaf galls produced on *R. javanica* L. (*R. chinensis* Mill., *R. semialata* Murr.) yield tannin

which is also sometimes used in making ink. The Asiatic *R. verniciflua* Stokes and sometimes *R. succedanea* L. are sources of natural lacquer. Commercial vegetable wax is obtained from the mesocarp of fruits of the last and some allied species.

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